Workshop

Smart Factories: A New Challenge for Dependable and Secure Computing
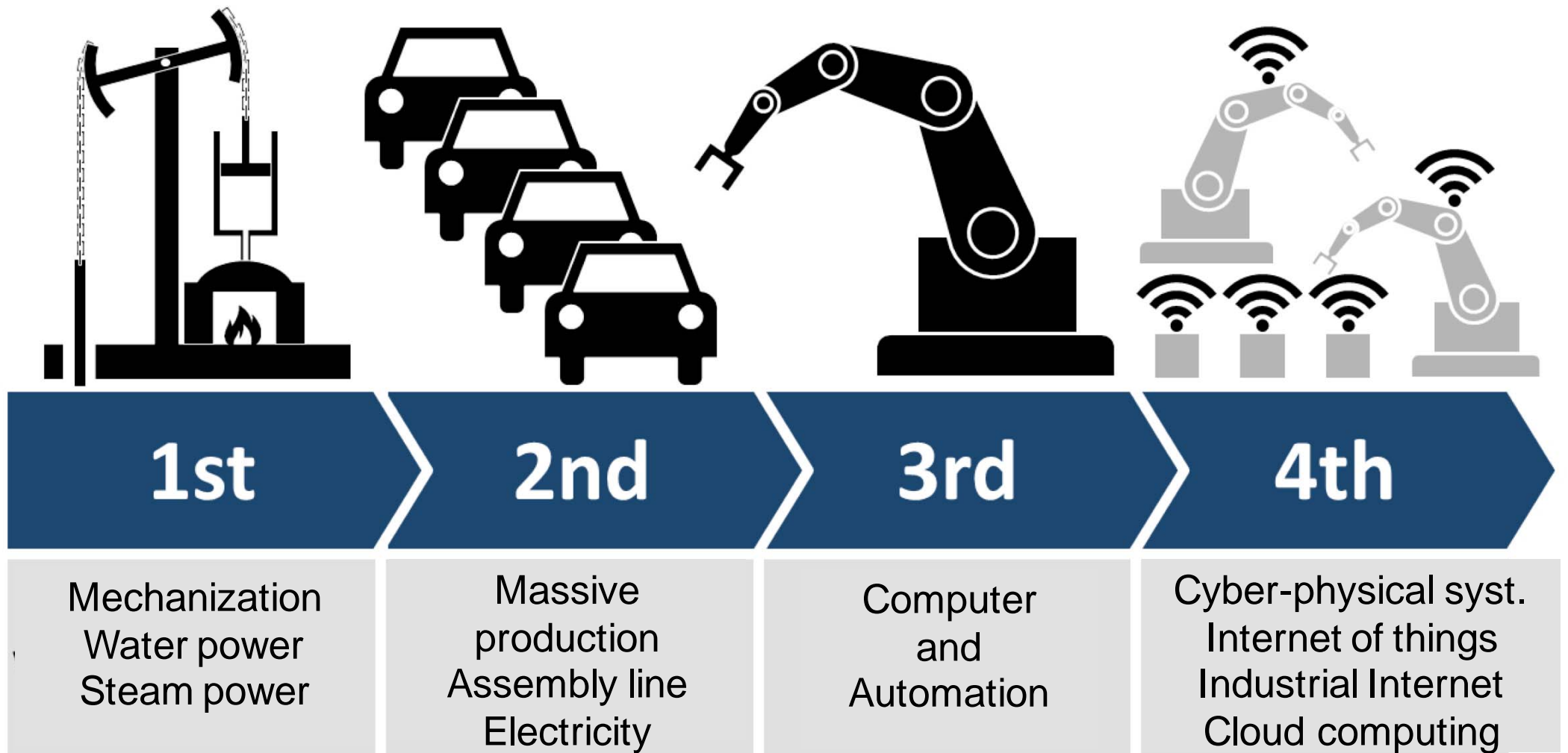
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Factory of the Future / **Industry 4.0**

1st	2nd	3rd	4th
Mechanization Water power Steam power	Massive production Assembly line Electricity	Computer and Automation	Cyber-physical syst. Internet of things Industrial Internet Cloud computing

Technologies to Transform Industrial Production

Autonomous robots

Big data and analytics

Simulation

Augmented reality

Industry 4.0

Horizontal and vertical system integration

Additive manufacturing

The cloud

Cybersecurity

The Industrial Internet of Things

Source: BCG

'Factories of the Future 2020'
Roadmap 2014-2020

- **Public-private partnership (PPP) under EU Horizon 2020**

- **Strategic multi-annual research roadmap produced by EFFRA (European Factories of the Future Research Association)**
  http://www.effra.eu/attachments/article/129/Factories%20of%20the%20Future%202020%20Roadmap.pdf

- **Rationales**
  - **Cost-effectiveness**
  - **Flexibility**
  - **Attractiveness**

- **Identified Research priorities and Innovation domains**
  - **Advanced manufacturing processes**
  - **Adaptive and smart manufacturing systems**
  - **Digital, virtual and resource-efficient factories**
  - **Collaborative and mobile enterprises**
  - **Human-centered manufacturing**
  - **Customer-focused manufacturing**

Towards "Smarter" Factories

- **Context**
  - ◆ Pervasive deployment of massively connected smart objects
  - ◆ Related concepts of "Ambient Intelligence", "Internet of Things", "Industrial Internet" and "Cyber-Physical Systems", etc.

- **Objective**
  - ◆ Modern development procedures and facilities
  - ◆ Highly innovative and sophisticated practices and shops
  - ◆ Most advanced digital (HW& SW) as key enabling technologies

- **Some Enabling Technologies**
  - ◆ Massive deployment of networked sensors
  - ◆ Exchange and processing of huge data sets
  - ◆ Cooperative work of computer-suited personnel and robots,
  - ◆ Complex "system-of-systems" optimization and decision making, etc.

Some Key Features

- Global Perspective: "Smart" People, Home, City, Factory, Farm, etc.
  —> Convergence of Requirements
  —> Generic Solutions —> ICTs the Backbone

- Autonomous, Mobile, Increasingly Connected and Interdependent Users/Systems

- More dependency with respect to the infrastructure and communications —> Resilience: a Pre-requisite

- More Open Systems, thus vulnerable to Malicious Attacks
  —> Security —> Safety

- Multidisciplinary Vision Mandatory
  - Privacy, Legal Issues, Acceptability -> Adoption, …

A Vision of Digital Manufacturing... ☺

Brett Ryder